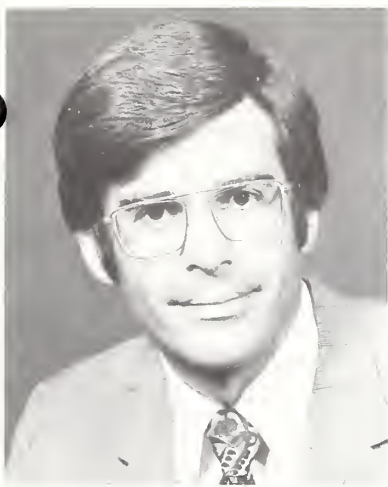


APPLIED ECONOMICS PROGRAM

STAFF





Harold E. Marshall

Chief, Applied Economics Program
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Ph.D., Economics, George Washington University, 1969.
M.A., Economics, George Washington University, 1966.
B.A., Economics, George Washington University, 1964.

As Chief of the Applied Economics Program, plans and supervises research projects performed by staff economists, engineers, and operations researchers; has technical and administrative responsibility for all Economics Program work performed for NBS as well as for sponsoring agencies; advises higher levels of management on economic matters; and participates in professional conferences and seminars through lectures and publications.

In the past has provided interdisciplinary project leadership and independent research for a government consulting group doing economic research for Federal, State, and local agencies on a reimbursable basis. Completed four projects: benefit-cost analysis of building a \$2 million "clean facility" for scientific research at NBS; a pricing-production policy study for Standard Reference Materials produced and sold by NBS; and two water resources cost-sharing studies, one for the National Water Commission and one for the Army Corps of Engineers. Also worked as an independent researcher in the Economics Research Service of the U.S. Department of Agriculture.

Teaching experience: Visiting Assistant Professor of Economics, World Campus Afloat Program, Chapman College. Taught Economic Principles, International Trade, Comparative Economic Systems, Economic Development, and World Studies on a floating university that traveled to 26 countries each academic year. Also taught economics at George Mason University and the George Washington University.

Publications

"Life-Cycle Costing Guide for Energy Conservation in Buildings," Chapter in **Energy Conservation Through Building Design**, McGraw Hill (In Press), 1978, co-author.

Principles of Economics Applied to Investments in Energy Conservation in Buildings, National Bureau of Standards Report (In Press), 1978, co-author.

"Cost Savings From Reduced-Size Venting," **Plumbing Engineer**, July/August, September/October 1977, co-author.

"Energy Conservation Through Life-Cycle Costing," **Journal of Architectural Education**, February 1977, 42-51, co-author.

"Potential Savings from using Reduced-sized Venting in the United States," **Proceedings of the USNCCIB/CIB International Symposium on Water Supply and Drainage**, September 28-30, 1976 (In Press), co-author.

"Efficiency Problems From User Fees in Municipal Wastewater Treatment," **Water Resources Bulletin**, October 1976, 903-917, co-author.

"Efficiency Impacts of Cost Sharing on Shoreline Management," **Coastal Zone Management Journal**, II, No. 4, 1976, 369-382.

- "Comment on the Pros and Cons of Life-Cycle Costing," Proceedings of the 1976 Conference on Improving Efficiency and Performance of HVAC Equipment and Systems for Commercial and Industrial Buildings, April 11-14, Lafayette, Indiana: Purdue University.**
- "Comment on the Background, Progress, and State-of-the-Art in Applying Life-Cycle Concepts in Buildings and Systems," Proceedings of the 1976 Conference on Improving Efficiency and Performance of HVAC Equipment and Systems for Commercial and Industrial Buildings, April 11-14, Lafayette, Indiana, Purdue University.**
- "Cost Sharing to Induce Efficient Techniques of Abating Wastewater Pollution," Journal of Environmental Economics and Management, II, No. 2, 1975, 107-119, co-author.**
- "Cost Sharing for Recreation: Efficiency and Equity: Comment," Land Economics, LI, No. 3, 1975, 300-303.**
- "Cost Sharing and Efficiency in Salinity Control," Chapter 8 in Salinity in Water Resources, Edited by J. E. Flack and C. W. Howe. Boulder, Colorado: Merriman Publishing Company, 1974, 139-152.**
- Analysis of Cost-Sharing Programs for Pollution Abatement of Municipal Wastewater. Socioeconomic Environmental Studies Series, EPA A-600/5-74-031. Washington, D.C.: U.S. Environmental Protection Agency, 1974, co-author.**
- Cost Sharing as an Incentive to Attain the Objectives of Shoreline Protection. NBS Report to the Army Corps of Engineers. National Technical Information Service, NTIS No. Com 74-10541, 1973.**
- "Cost Sharing and Multiobjectives in Water Resource Development," Water Resources Research, IX, February 1973, 1-10.**
- Federal Cost-Sharing Policies for Water Resources, NBS Report No. 10-666, Washington, D.C., December 1971.**
- "Economic Efficiency Implications of Federal-Local Cost Sharing in Water-Resource Development," Water Resources Research, June 1970, 673-682.**
- "Optimal Cost-Sharing Rules for Efficient Water-Resource Development," 1969 Proceedings of Western Agriculture Economics Association.**



Robert E. Chapman

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Applied Economics Program
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Ph.D. Economics Program, George Washington University.
M.A., Statistics, Indiana University, 1974.
B.A., Mathematics, Western Maryland College, 1972.

As an operations research analyst in the Applied Economics Program, provides project leadership and independent research for research studies in the areas of energy conservation in low-income housing, fenestration, fire safety in hospitals and nursing homes, and disaster mitigation. Participates in multidisciplinary research teams, and in professional conferences and seminars through lectures and publications. Serves on the Federal Construction Council standing committee for computer technology.

In the past, has developed econometric models for forecasting the costs of eliminating the lead-based paint hazard from buildings. Formulated a benefit-cost methodology for determining the efficiency of various levels of protection against progressive collapse in buildings. Aided in the development of mathematical models to quantify the incidence of abnormal loading in buildings due to motor vehicle impact and accidents involving hazardous materials. Participated in a program to develop simulation models for evaluating the effectiveness of alternative maintenance strategies for large deck aircraft carriers.

Teaching Experience: Instructor of Mathematics/Economics, Western Maryland College. Taught course showing how Operations Research may be used as a framework for defining and dealing with problems in the public sector. Associate Instructor of Mathematics, Indiana University. Taught courses in Finite Mathematics and in Probability and Statistics, emphasizing the role which mathematics plays in the management process.

Publications:

An Economic Evaluation of Windows in Buildings, NBS Building Science Series (In Press), co-author.

Guidelines for Cost-Effective Lead Paint Abatement, NBS Technical Note (In Press), co-author.

Lead Paint Abatement Costs: Some Technical and Theoretical Considerations, NBS Technical Note (In Press), co-author.

A New Look At Windows, NBSIR 77-1388, January 1978, co-author.

"Economic Analysis of Alternative Window Strategies," **Proceedings of the RILEM/ASTM/CIB Symposium on Evaluation of the Performance of External Vertical Surfaces of Buildings**, August 1977, Helsinki, Finland, co-author.

"Lead Paint Poisoning: A Closer Look at the Costs," **Journal of Housing**, November 1976.

Economic Analysis of Experimental Lead Paint Abatement Methods: Phase I, NBS Technical Note 922, September 1976.

Economics of Protection Against Progressive Collapse, NBSIR 75-542, September 1974, co-author.

The Incidence of Hazardous Material Accidents During Transportation and Storage, NBSIR 73-412, November 1973, co-author.

Estimates of Vehicular Collisions with Multistory Residential Buildings, NBSIR 73-175, April 1973, co-author.

"Comment on Designing Duct Systems for Minimum Life-Cycle Cost," Proceedings of the 1976 Conference on Improving Efficiency and Performance of HVAC Equipment and Systems for Commercial and Industrial Buildings, April 11-14, Lafayette, Indiana: Purdue University.



Phillip T. Chen

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Applied Economic Program
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B.S.C.E., Civil Engineering, Ohio University, 1952.
B.S. Mathematics, Ohio University, 1952.

As a researcher in the Applied Economics Program, conducts applied research on energy conservation in buildings; identifies alternative techniques for conserving energy in the construction, operation, and maintenance of buildings; and develops methods to evaluate the alternative techniques. Has advised the foreign governments of Korea, Taiwan, and Ethiopia on the design, construction, operation and maintenance of laboratory buildings.

In the past, developed a model of the federal government building process, identified the needs of cost engineering services in the building process, and developed a methodology for life-cycle costing of buildings. At various times acted as Assistant Section Chief.

Was responsible for the planning, design, construction, contract management, and moving for the complete relocation of the National Bureau of Standards from Washington, D.C. to Gaithersburg, Maryland: 23 buildings with 209 thousand square meters of laboratory space. Served as a member of the Equal Employment Opportunity Committee from 1961 to 1969.

As practicing engineer, provided consulting engineering services as structural engineer, construction manager, and civil engineer for office buildings, stadiums, manufacturing plants, laboratories, and sewer and water treatment plants.

Publications:

Economic Analysis of the Norris Cotton Federal Office Building, NBSIR (In Press), 1978.

Interim Report: Lead Paint Detection in Residential Dwellings, A Cost Analysis, NBSIR 10680, January 1972, co-author.

Interim Report: Cost Analyses of Lead Paint Hazard Elimination Methods, NBSIR 10670, January 1972, co-author.

Final Report on Building Economics Study Program Phase I - Analysis and Summary, NBSIR 1-245, May 1970, co-author.



Kimberly A. Hockenbery

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B.A., Mathematics, Western Maryland College, 1977.

As an operations research analyst, is involved in economic research in energy conservation and building problem areas. Participated in a team effort that assisted the Department of Energy in responding to Executive Order No. 12003 by preparing a guide for conducting life-cycle cost analyses of alternative energy conservation projects in Federal buildings. Has assisted in the data analysis, computer programming, and economic evaluation of lead paint abatement techniques, alternative window designs, and incentives for solar energy.

Currently involved in projects to estimate the costs and energy savings associated with alternative weatherization options for low-income housing, and to determine least-cost ways in which health care facilities can meet existing fire safety codes.

Publications:

Life-Cycle Costing Guide for Selecting Energy Conservation Projects for Public Buildings, NBS Building Science Series 113, 1978 (In Press), co-author.



Joel Levy

Economist, Applied Economics Program
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M.S., Political Economy, Johns Hopkins, 1950.
B.A., Mathematics, Yeshiva College, 1945.

As an economist in the Applied Economics Program, studied problems of developing economically efficient equipment maintenance policies for energy conservation, analyzed economics problems connected with development of energy conservation performance standards for buildings, and served as subject specialist consultant in economics to the NBS Library.

In the past, has conducted investigations in the economic efficiency of integrated utility systems to supply multiple utility services to housing developments; participated in a project designed to assist the Coast Guard, through a computer simulation model, in achieving an optimal use of resources assigned to search and rescue operations; worked on problems of automated Post Office sorting operations; participated in the analysis of the concept of capacity of an airport for the Federal Aviation Administration; and conducted studies in inventory theory.

Publications:

"Efficient Equipment Maintenance: A Tool for Energy Conservation," **American Association of Cost Engineers Bulletin**, March/April 1978.

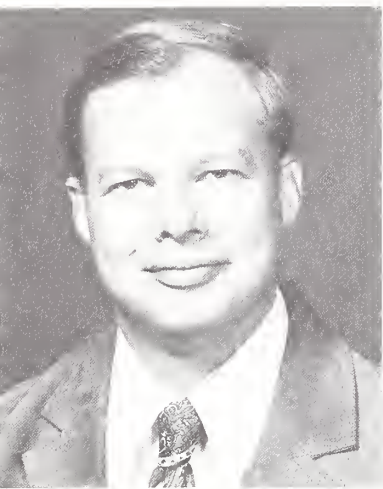
Equipment Maintenance for Energy Conservation, NBSIR 77-1210, February 1977.

"The Optimal Size of a Storage Facility," **Naval Research Logistics Quarterly**, XXI, June 1974.

"Further Notes on the Loss Resulting from the use of Incorrect Data in Computing an Optimal Inventory Policy," **Naval Research Logistics Quarterly**, March 1959.

"Loss Resulting from the Use of Incorrect Data in Computing an Optimal Inventory Policy," **Naval Research Logistics Quarterly**, March 1958.

"Optimal Inventory Policy When Demand is Increasing," **Operations Research**, December 1950.



John S. McConnaughey

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Ph.D., Economics, Michigan State University, 1976.
M.A., Economics, Michigan State University, 1974.
B.A., History, University of Washington, 1962.

As economist in the Applied Economics Program, conducts economic research, provides technical reviews of reports and consulting services to other divisions and agencies, and participates in conferences and seminars. Current research is on the economics of building regulations and on Energy conservation in buildings.

In the past, focused his research on building economics. Dissertation was "Production Functions in Contract Construction for the United States, 1972." As a research assistant for the National Academy of Sciences, co-authored a report for the Academy entitled "Appropriate Technology for Residential Construction in Less Developed Countries: A Survey of Research Trends and Possibilities."

Other Experience: Graduate teaching assistant in courses on Introductory and Intermediate Economics, Monetary Economics, and Urban Economics. He is a Naval Reserve Officer, has lived in Morocco and Cyprus, and is familiar with the political, economic, and social institutions in the Middle East.

Publications:

"The Economic Characteristics and Origins of Building Innovations in Developing Areas," **Journal of Developing Areas**, 1979 (In Press), co-author.

An Economic Analysis of Building Code Impacts, National Bureau of Standards, NBSIR, 1978 (In Press).

Life-Cycle Costing Guide for Selected Energy Conservation Projects for Public Buildings, NBS Building Science Series 113, 1978 (In Press), co-author.

"Economic Impacts of Building Codes" in **Research and Innovation in the Building Regulatory Process**, NBS Special Publication 473, June 1977.

Comment on "Energy System Simulation Analysis by Computer for a Navy Flight Training Facility to Determine the Economic Feasibility of Total Heat Recovery," **Proceedings of the 1976 Conference on Improving Efficiency and Performance of HVAC Equipment and Systems for Commercial and Industrial Buildings**, April 11-14, Lafayette, Indiana: Purdue University.

"Innovationer inom u-landernas byggtersamhet," **Byggmastaren** ("Building Innovations in Developing Countries," **Journal of Swedish Building**), March 1975 and April 1975, co-author.



Stephen R. Petersen

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M.A., Economics, University of California (Los Angeles), 1972.

B.A., Economics, University of California (Berkeley), 1969.

As Project Leader for various projects related to economics of energy conservation in buildings, conducts research on life-cycle energy-related building costs, evaluates energy-related design modifications to buildings for their cost effectiveness, and develops computer and tabular methodologies for applying economic analysis to decision making in energy conservation design problems. Serves as a consultant to other government agencies (DoE, HUD, GSA) on problems related to energy conservation in buildings. Special interests include economic efficiency criteria in standards development, life-cycle cost analysis in government decision-making policy, and alternative design of new buildings to reflect both climatic and economic variables. Is a member of the Energy Conservation Standards Task Force at NBS.

Past Experience: Economist at the Defense Intelligence Agency, performing cost analyses of historical weapons development programs and alternative military forces projections. Russian interpreter, U.S.A.F.

Publications:

The Role of Economic Analysis in the Development of Energy Standards for New Buildings, NBSIR (In Press).

NBSLD-XO: Expanded Output for Thermal Performance Analysis of Building Envelope Components, NBS Building Science Series (In Press), 1978, co-author.

"Economic Analysis," Chapter 6 in **Air Force Energy Conservation Handbook**, Vol. 2, NBSIR 77-1238, June 1977.

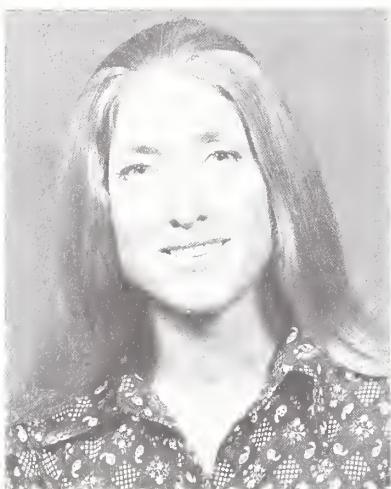
"Economic Optimization in the Energy Conservation Design of Single-Family Housing," **American Society of Heating, Refrigerating, and Air-Conditioning Engineers Transactions**, Volume 81, Part 1, July 1976.

Making the Most of Your Energy Dollars in Home Heating and Cooling, NBS Consumer Information Series 8, Government Printing Office, GPO No. C13.53:8, June 1975, co-author.

"Energy Conservation in New Housing Design," **Science**, June 25, 1976, co-author.

Retrofitting Existing Housing for Energy Conservation: An Economic Analysis, NBS Building Science Series 64, GPO No. C13.29/2:64, December 1974.

"Financial Evaluation Procedures," Chapter 5 in **Energy Conservation Program Guide for Industry and Commerce**, NBS Handbook 115, GPO No. C13.11:115, September 1974.



Rosalie T. Ruegg

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M.A., Economics, University of Maryland, 1966.

B.A., Economics, University of North Carolina, 1964.

As an economist in the Applied Economics Program, serves as leader for solar energy economics and provides project leadership and independent research for studies of energy conservation in buildings, fenestration, construction financing, new building techniques, industrial waste heat management, and cost-sharing programs for abatement of wastewater pollution. Presents findings through publications, lectures, and professional conferences, and serves as a consultant to other divisions and agencies on economic topics.

Previously planned and led multidisciplinary projects for a government consulting group which worked on a reimbursable basis on problems of Federal, State, and local governmental agencies. Major projects included an economic analysis of police patrol vehicles for the Department of Justice; a pricing-production policy study of Standard Reference Materials produced and sold by NBS; and a marketing study of a security mail service for the U.S. Postal Service.

As a financial economist in the Banking Section of the Board of Governors of the Federal Reserve System, prepared monthly reports on national money and credit developments and analyzed current lending practices of financial institutions.

As a part-time Instructor on Economics, taught Economic Principles, Economic History, and Economic Geography at Montgomery College (Rockville, MD).

Is a member of Phi Beta Kappa and a former Woodrow Wilson Fellow.

Publications:

"Reduced-Sized Venting in the United States and its Potential Cost Savings," **Proceedings of the USNCCIB/CIB International Symposium on Water Supply and Drainage**, (In Press), co-author.

"Microeconomics of Solar Energy," **Solar Energy Handbook**, Editor, Jan F. Kreider, The McGraw-Hill Book Company (In Press), co-author.

Economic Evaluation of Windows in Buildings, Vols. I and II, NBS Building Science Series (In Press), 1978, co-author.

"Life-Cycle Costing Guide for Energy Conservation in Buildings," Chapter in **Energy Conservation Through Building Design**, Architectural Record Books/McGraw Hill (In Press), 1978, co-author.

Life-Cycle Costing Guide for Selecting Energy Conservation Projects for Public Buildings, NBS Building Science Series 113, (In Press), 1978, co-author.

Principles of Economics Applied to Investments in Energy Conservation in Buildings, National Bureau of Standards Report (In Press), 1978, co-author.

A New Look at Windows, NBSIR 77-1388, January 1978, co-author.

"Life-Cycle Cost Evaluation of the Personal Patrol Car Program, **Journal of Police Science and Administration**, Vol. 5, No. 3, September 1977.

"Economic Analysis of Alternative Window Strategies," **Proceedings of the RILEM/ASTM/CIB Symposium on Evaluation of Performance of External Vertical Surfaces of Buildings**, co-author, August 1977.

"Cost Savings from Reduced-Sized Venting," **Plumbing Engineer**, July/August, September/October 1977, co-author.

"Using Economic Analysis to Achieve Cost-Effective Energy Conservation in Buildings," **Transactions of the 1977 Annual Meetings of the American Association of Cost Engineers**, June 1977, pp. 196-202.

"Energy Conservation in Buildings Through Life-Cycle Costing," **Journal of Architectural Education**, April 1977, co-author.

The Police Patrol Car: Economic Efficiency in Acquisition, Operation, and Disposition, NBS Special Publication 480-15, April 1977.

"Cost-Effective Energy Conservation," **Energy Conservation Through Sun Control; Proceedings from a Conference on Retrofit Shading**, Solar Science Industries, Inc., Beltsville, Maryland, March 18, 1977.

"Economics of Waste Heat Recovery," **Waste Heat Engineering Guidebook**, ed. Kenneth G. Kreider and Michael B. McNeil, NBS Handbook 121, February 1977, pp. 25-51.

"Life Cycle Costs and Solar Energy," **ASHRAE Journal**, November 1976, pp. 22-23.

"Efficiency Problems from User Fees in Municipal Wastewater Treatment," **Water Resources Bulletin**, Vol. 12, No. 5, October 1976, pp. 903-917, co-author.

Evaluating Incentives for Solar Heating, NBSIR 76-1127, September 1976.

"Comment on Life Cycle Cost and Economic Analysis of a Private Owner or Investor," **Proceedings of the 1976 Conference on Improving Efficiency and Performance of HVAC Equipment and Systems for Commercial and Industrial Buildings**, Lafayette, Indiana: Purdue University, April 11-14, 1976.

"First Cost-Operating Cost Trade-offs for Air Conditioning Equipment: A Commentary on the Cost Analysis," **Addendum to the Proceedings of the Conference on Improving Efficiency in HVAC Equipment and Components for Residential and Small Commercial Buildings**, Lafayette, Indiana: Purdue University, 1975.

"Cost Sharing to Promote Efficient Techniques of Abating Municipal Wastewater Pollution," **Journal of Environmental Economics and Management**, Vol. 2, No. 2, pp. 107-119, December 1975, co-author.

Solar Heating and Cooling in Buildings: Methods of Economic Evaluation, NBSIR 75-712, 40 pp., July 1975.

Analysis of Cost-Sharing Programs for Pollution Abatement of Municipal Wastewater, Socioeconomic Environmental Studies Series, EPA A-600/5-74-031, U.S. Environmental Protection Agency, Washington, D.C. 1974, co-author.

Life Cycle Costing of Police Patrol Cars: Summary Report, NBSIR 74-471, March 1974.

Forecasting Marine Activities: An Annotated Bibliography for U.S. Coast Guard Planning, NBS Report 10910, September 1972, co-author.



G. Thomas Sav

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Ph.D. Candidate, Economics, George Washington University.
M.A., Economics, George Washington University, 1976.
B.A., Economics, University of West Florida, 1973.

As an economist in the Applied Economics Program, carries out economic research in applied microeconomics. Currently conducts research in the microeconomics of solar energy in buildings, with special emphasis on applications in commercial buildings.

In the past: focused on the economics of natural disasters, total energy systems, rehabilitation and abandonment of housing, and energy conservation in buildings.

Previous Experience: Economist at the U.S. Nuclear Regulatory Commission. Performed econometric studies of the demand for electricity, cost-benefit analyses of alternative heat dissipation systems in nuclear power generation, studies of alternative pricing arrangements (e.g., peak load pricing) in the electric power industry and their impacts on electric demand, and cost analyses of nuclear power generation. Provided written and oral testimony before the U.S. Atomic Safety and Licensing Board regarding above studies and analyses.

Publications:

"Microeconomics of Solar Energy," **Solar Energy Handbook**, Editor, Jan F. Kreider, The McGraw-Hill Book Company (In Press), co-author.

Life-Cycle Costing Guide for Selecting Energy Conservation Projects for Public Buildings. NBS Building Science Series 113, 1978, (In Press), co-author.

"Determinants of Research and Development Activity by Electric Utilities: Comments and Additional Evidence," **The Bell Journal of Economics** (In Press).

"R&D Decisions Under Alternative Regulatory Constraints," **Atlantic Economic Journal**, V, July 1977.

Natural Disasters: Some Empirical and Economic Considerations, NBSIR 74-473, February 1974.



Stephen F. Weber

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Ph.D., Economics, University of Wisconsin (Madison), 1974.
M.A., Economics, University of Wisconsin (Madison), 1971.
M.A., Theology, St. John's University (Minnesota), 1966.
B.A., Philosophy/Mathematics, St. John's University (Minnesota), 1963.

Plans, develops, conducts, and supervises economic research projects in the areas of adaptive reuse of existing buildings, total energy and modular integrated utility systems, non-destructive evaluation techniques, and solid waste management. Disseminates research results through reports, publications, and lectures. Conducts technical reviews of reports and serves as economic consultant and advisor to other divisions and agencies.

In one current research project, analyzes the effects which certain tax provisions of the Tax Reform Act of 1976 have on the after-tax life-cycle cost of a recycled building as compared with a new building. In another project, is developing a method for allocating the costs of solid waste disposal among waste components according to both weight and volume.

In the past, analyzed the effects of using shadow (social) prices of energy in developing optimal performance standards for energy conservation in buildings; developed guidelines for the economic evaluation of Modular Integrated Utility Systems; contributed to homebuyers' guide to energy-saving features of houses, and to an NBS compendium of research on energy conservation in buildings; and helped develop the economics of Minimum Property Standards for solar energy. For the Chilean government developed and applied a method of social benefit-cost analysis to a project to consolidate many small contiguous mines into a single large-scale open pit operation. For the Institute on Poverty Research (University of Wisconsin), analyzed the equity effects of earnings exemptions provisions of Negative Income Tax proposals.

Teaching Experience: Assistant Professor of Economics, Bentley College (Waltham, MA). Taught Economic Principles, Statistics, and Urban Economics.

Publications:

"Methods of Economic Evaluation," Chapter 6 of **Energy Conservation Research, in Residential Buildings**, NBSIR (In Press).

"Financial/Economic Evaluation Plan," Chapter 4 of **MIUS Demonstration Evaluation Guidelines**, NBSIR (In Press).

"Insulation," Chapter 4 of **Twin Rivers Homebuyers' Manual**, NBSIR (In Press), co-author.

Historic Preservation Incentives of the 1976 Tax Reform Act: An Economic Analysis, NBS Technical Note 980, 1978 (In Press).

"Resource Impact Factors and Optimal Energy Conservation Standards for Buildings," **Energy and Buildings**, Volume I, No. 2, October 1977.

The Effect of "Resource Impact Factors" on Energy Conservation Standards for Buildings, NBSIR 77-1199, February 1977.

"Comment on Life-Cycle Costing and the General Services Administration," Proceedings of the 1976 Conference on Improving Efficiency and Performance of HVAC Equipment and Systems for Commercial and Industrial Buildings, April 11-14, Lafayette, Indiana: Purdue University.

"Comment on The Mystery of Future Energy Prices," Proceedings of the 1976 Conference on Improving Efficiency and Performance of HVAC Equipment and Systems for Commercial and Industrial Buildings, April 11-14, Lafayette, Indiana: Purdue University.